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A REASSESSMENT OF *CALOCIASMA* WITH THE DESCRIPTION OF A NEW GENUS AND A NEW SPECIES (LEPIDOPTERA: RIODINIDAE: NYMPHIDIINI)

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Abstract.—The genus *Calociasma* appears to be polyphyletic and contains members that belong to all three currently recognized subtribes of the Nymphidiini. Only the type species, *ictericum,* and *laius* are retained in *Calociasma,* which belongs to the subtribe Nymphidiina. The taxa *pulcherrima, comparata* and *felicis* are removed to *Juditha* (**n. combs.**) in the Lemoniadina, and *lilina* (**n. comb.**) and its newly described sister species from Panama, *robbinsi* **n. sp.,** are placed in the new genus *Calicosama* **n. gen.** in the Theopeina. *Calicosama* is characterized, and its biology and systematic position discussed.

Key words: *Calociasma,* cladistics, genitalia, morphology.

Stichel (1910) erected the genus *Calociasma* to include the three species, *ictericum* Godman and Salvin, 1878, *pulcherrima* Butler, 1867, and *lilina* Butler, 1870, with the former as the type species, and subsequently added *laius* Godman and Salvin, 1886, in the following year (Stichel, 1911). Although this arrangement has been followed ever since (Stichel, 1930–31; Bridges, 1988, 1994), this genus, like many others in the tribe Nymphidiini Bates, 1859 (*sensu* Hall, 1999a, b), is polyphyletic (Hall, in prep.), and these species seem to have been treated together solely on the basis of superficial wing pattern similarities. In fact, as currently conceived, *Calociasma* contains members that belong to all three subtribes of the Nymphidiini (Hall, 1999a, b).

The current tentative subtribal arrangement for the Nymphidiini is intended to facilitate communication on the group, and the monophyly of each remains to be tested. While the basal Lemoniadina Kirby, 1871 (=Lemoniini Auctt.—see Hall and Heppner, 1999) is undoubtedly paraphyletic and in need of further subdivision, the Nymphidiina and Theopeina Clench, 1955, grouped by their members possessing a ventrally positioned third abdominal spiracle (Harvey, 1987) and by lacking a spot in ventral hindwing cell Sc+R1 (Hall, unpubl. data), are reasonably well characterized. The male genitalia of Nymphidiina species have valvae joined at the tip by sclerotized tissue, and those of Theopeina species have valvae joined by membranous tissue and typically have an incomplete vinculum at the anterior margin of the tegumen and lack a saccus (Hall, 1999a, b, in press).

By having a dorsally positioned third abdominal spiracle, and by lacking any of the characters typical of the Nymphidiina and Theopeina, *pulcherrima* can be placed in the Lemoniadina. We place *pulcherrima* and its associated taxa *comparata* Stichel, 1911, and *felicis* Rebillard, 1958, in *Juditha* Hemming, 1964 (**n. combs.**), because they possess very long setae between the inner base of the male genital valvae and the pedicel (illustrated by Stichel (1911) and Penz and DeVries (1999)), a unique

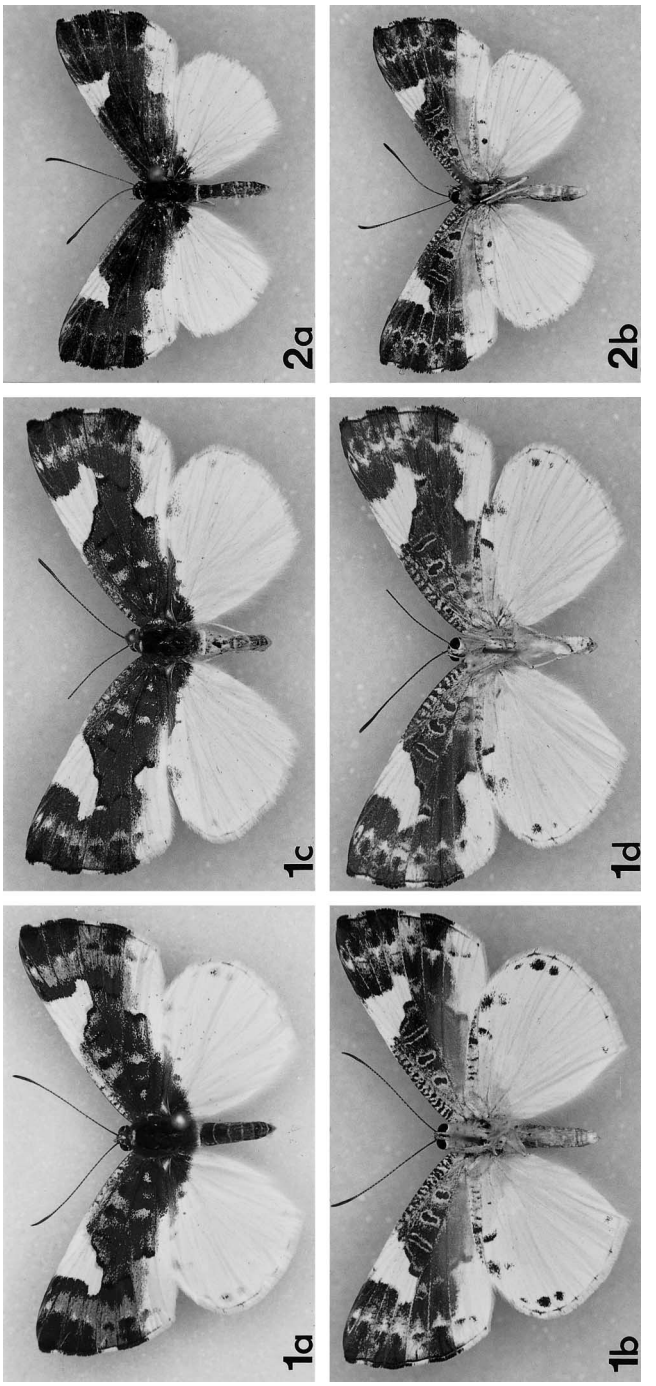
synapomorphy for that genus (Hall and Harvey, in press). The taxon *lilina* possesses all those characters typical of the Theopeina (Hall, 1999a, in press), however, a comprehensive morphological cladistic analysis of this subtribe indicates that *lilina* does not possess the synapomorphies for any of its constituent genera (Hall, 1999a, in press). Thus, the main purpose of this paper is to describe and define the new genus *Calicosama* for *lilina* (**n. comb.**) and its sister species, which we also describe here. The only remaining species of *Calociasma* are *ictericum* and *laius*, which can be placed in the Nymphidiina. Only these two species in the Riodinidae possess a pale triangle at the costa of the female forewing and an eighth male abdominal sternite with two short symmetrical and well sclerotized posterior projections.

Dissections were made using standard techniques, abdomens being soaked in hot 10% potassium hydroxide (KOH) solution for approximately five minutes, and subsequently stored in glycerol. The terminology for male and female genital and abdominal structures follows Klots (1956) and Eliot (1973), and nomenclature for wing venation follows Comstock and Needham (1918).

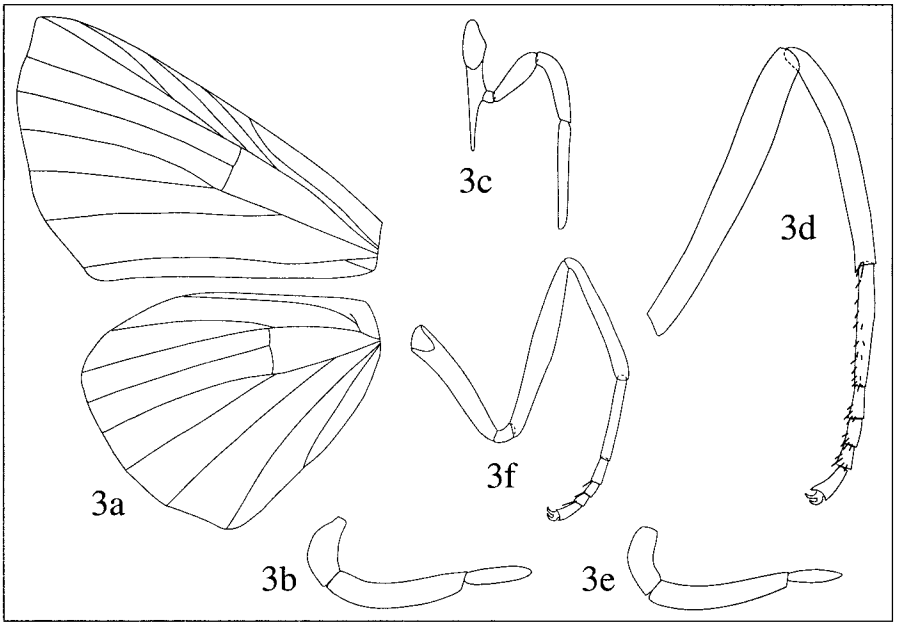
Calicosama Hall and Harvey, new genus
Figs. 1–6

Type species. *Nymphidium lilina* Butler, 1870.

Description. *Male*: Forewing length 14.5–22 mm. *Wing shape.* Forewing elongate, costal margin almost straight, distal margin slightly convex; hindwing somewhat elongate, apex and tornus rounded. *Venation* (Fig. 3a). Four forewing radial veins. *Dorsal surface.* Forewing ground color shades of russet brown; blue scaling variably prominent surrounding black or brown spots at base, middle and end of discal cell, and as two marks at base of cell Cu2, white postdiscal triangle or rectangle extends from costa to or near vein M3 then becomes jagged black line (with blue scaling proximally in *lilina*); white rectangle at tornus extends two-thirds distance towards wing base below vein 2A, contains two faint black marks at submargin of cell Cu2 with blue and/or russet brown intruding into middle of white in same cell; costa and submargin russet brown or black, submargin lined proximally with entire circles or semicircles of blue, blue scaling at margins of cells M1 and/or M3; fringe black except below vein Cu2 and as small patches of scales in cells M3, and M1 and R4+5. Hindwing ground color white; black at very wing base, a small disjunct black fleck towards base of discal cell; fringe entirely white. *Ventral surface.* Forewing differs from dorsal surface in following ways: ground color black or brown, gray-brown at wing base below discal cell; black or brown spots in and below discal cell more prominent and contrasted against background by surrounding blue-white scaling, blue scaling reduced and replaced with very pale blue-white scaling; submarginal blue-white always forms circles. Hindwing differs from dorsal surface in following ways: mottled pale brown scaling along basal two-thirds of costa, three black spots towards base, at middle and towards distal end of cell Sc+R1, a few black marginal scales in cells M2 and M1. *Head.* First and second segments of labial palpi largely white, third segment largely brown; second and third segments elongate (Fig. 3b). Eyes bare and black, marginal scaling white. Frons brown with faint white medial band and white lateral scaling. Antennal segments brown with white lateral scaling, narrow nudum along ventral inner margin; clubs brown, tips orange-brown.

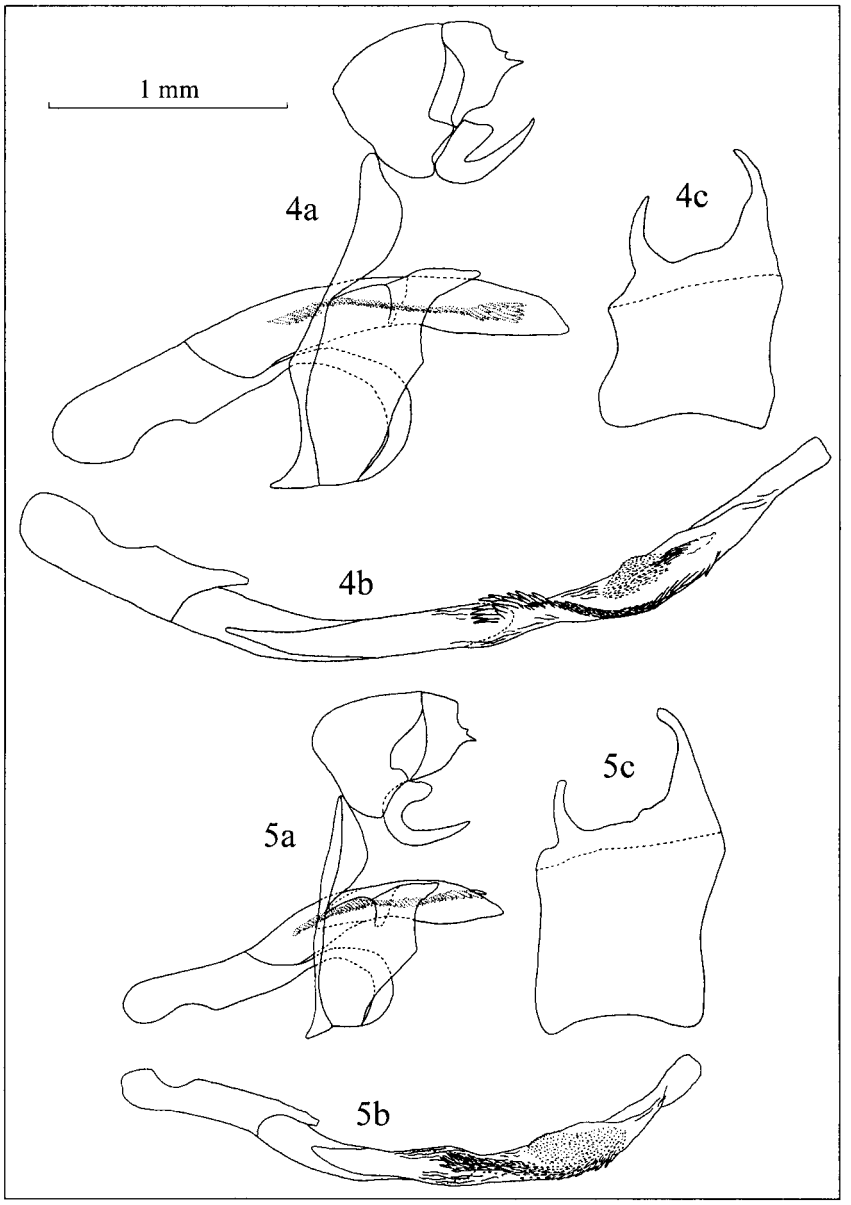


Figs. 1–2. 1. *Calicosama lilina* Butler, male, Paraiso, Canal Zone, Panama (USNM): a) dorsal surface; b) ventral surface. Female, Summit, Canal Zone, Panama (USNM): c) dorsal surface; d) ventral surface. 2. *Calicosama robbinsi* Hall and Harvey n. sp., holotype male, Cerro Pelado, Canal Zone, Panama (USNM): a) dorsal surface; b) ventral surface.



Figs. 3a–f. Morphology. 3. *Calicosama lilina*, male: a) venation; b) palpus; c) foreleg; d) hindleg. Female: e) palpus; f) foreleg.

Body. Dorsal surface of thorax dark or russet brown with similarly colored tegula, ventral surface white; dorsal and ventral surface of abdomen white. All legs white; tarsus of foreleg unimerous and elongate, coxa elongate (Fig. 3c); midleg and hindleg with a tibial spur and two further tibial spines, a group of spines at inner distal tip of tarsal segments one to four, and several further spines along inner distal margin of first tarsal segment (Fig. 3d). *Genitalia* (Figs. 4a, b, 5a, b). Distal margin of uncus produced into two small points ventrally, concave dorsally; falces of average size and width for family; vinculum incomplete dorsally at anterior margin of tegumen, broad in upper portion, small saccus ventrally; valvae vertically elongate with a small upper basal bulge, a small medial distal projection that curves slightly inwards, and a large ''bird's head''-shaped upper distal projection; aedeagus of approximately even width, tapers gradually at tip which opens broadly to right, soft anterior tissue directed ventrally; everted vesica an elongate tube of approximately even width, basal half contains a variably curved band of small spines, oval-shaped raised area beside posterior curve of cornutal band consists of numerous rows of more sparsely positioned, tiny spines; pedicel heavily sclerotized and broad. Distal and ventral margin of eighth tergite concave, producing triangle at lower posterior corner. Eighth sternite heavily sclerotized at distal tip, and produced into two slightly inwardly curving asymmetrical posterior projections, a short left-hand one and a longer right-hand one; these posterior projections intraspecifically somewhat variable in length and exact shape (Figs. 4c, 5c).



Figs. 4–5. Male terminalia, a) lateral view of genitalia; b) right-dorsal view of aedeagus with vesica everted; c) ventral view of last sternite: 4. *Calicosama lilina*. 5. *Calicosama robbinsi* n. sp.

Female: Differs externally from male in following ways (*lilina* only): forewing length 20–23 mm. *Wing shape.* Both wings, but especially hindwing more elongate, distal margin slightly more convex. *Head.* Third palpal segment slightly more elongate (Fig. 3e); nudum broadly continuous along ventral inner margin of antennae. *Body.* Foreleg with a single long spine at inner distal tip of tarsal segments two to four (Fig. 3f). *Genitalia* (Fig. 6). Corpus bursae ovoid, signa form peg-like sclerotized invaginations with tiny teeth along inner distal tip, base horizontally broad; ductus bursae enlarged and sclerotized at posterior end; ostium bursae a large, broad, angular, heavily sclerotized plate.

Etymology. The name is a euphonious anagram of *Calociasma* that refers to the patchwork pattern of the wings.

Systematic position. The taxon *lilina* was described by Butler (1870) in *Nymphidium* and then treated in *Lemonias* by Godman and Salvin (1886), before Stichel (1910) placed it in *Calociasma.* However, this last genus belongs in the nymphidiine subtribe Nymphidiina, and, as outlined in the introduction, the male genital and abdominal morphology of *lilina* place it and its newly described sister species (see below) in the subtribe Theopeina. A comprehensive morphological cladistic analysis of this subtribe that included all 75 described species, indicates that the ''*lilina* group'' or *Calicosama* is phylogenetically positioned between the basal genera *Protonymphidia* Hall, 2000, and *Archaeonympha* Hall, 1998, and the most derived genera *Behemothia* Hall, 2000, and *Theope* Doubleday, 1847 (Hall, 1999a, in press). A universal synapomorphy that unites *Calicosama* with *Behemothia* and *Theope* is the presence of a sclerotized dorsal invagination to the last abdominal male sternite. The species of these three genera also exhibit a variety of modifications to the shape of the last sternite not seen in species of *Protonymphidia* and *Archaeonympha,* which possess last sternites that are simple rectangles.

Diagnosis. The two *Calicosama* species superficially most closely resemble those of *Calociasma,* although they may be recognized by their elongate wing shape, almost entirely white hindwing and by the white postdiscal triangle at the costa of the forewing. However, the genitalia of the two genera are quite distinct (see Figs. 4–6 for those of *Calicosama,* and Stichel (1911) for the male genitalia of *Calociasma*). Morphological synapomorphies unique to *Calicosama* within the Nymphidiini are the presence of: 1) two long, asymmetrical posterior projections from the distal margin of the last male sternite; 2) a ''bird's head''-shaped upper projection to the male genital valvae, and; 3) aedeagal cornuti of the male genitalia that, when the vesica is everted, form a long, curved band of small spines beside a small, oval raised region consisting of numerous rows of minute spines. *Calicosama* species also exhibit a male genital character that is unusual in the Nymphidiini and unique within the Theopeina, namely the presence of ventrally instead of posteriorly directed soft tissue towards the anterior tip of the aedeagus.

Biology. Label data confirm what Godman and Salvin (1886) first stated, that *Calicosama lilina* is largely confined to drier semi-deciduous habitats. DeVries (1997) only reports it from dry forest in Costa Rica, while G. Lamas (pers. comm.) reports collecting it in dry mangrove forest in northwest Peru (see also Lamas, 1976). It occurs from sea-level to 1,200 m (DeVries, 1997). G. Small (*in* DeVries, 1997) reports finding males of *C. lilina* perching on the sides of tree trunks at 1400 hrs, and M. Cock (pers. comm.) reports finding it in Trinidad perching with its wings

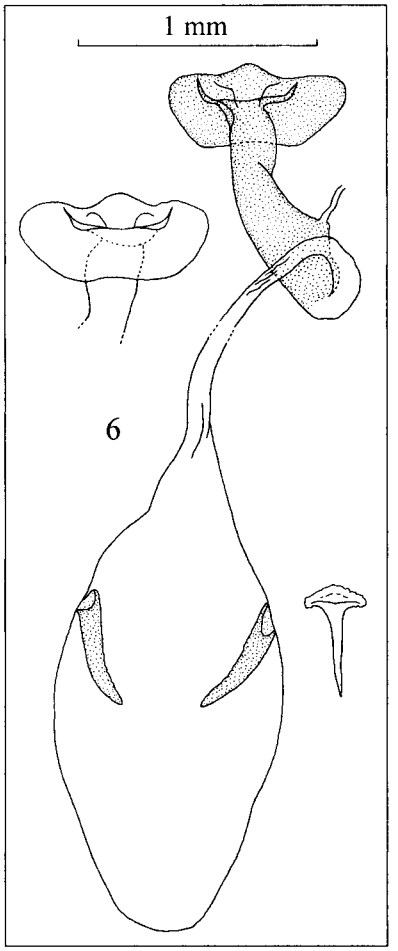


Fig. 6. Female genitalia in dorsal view: **6.** *Calicosama lilina.*

spread open. In contrast, *Calicosama robbinsi* is known only from wet lowland rainforest where males were encountered hilltopping in the afternoon (R. Robbins, pers. comm.).

Distribution. *Calicosama lilina* is widely distributed to the west of the Andes from Mexico to northwestern Peru, and in northern Venezuela and Trinidad, while *C. robbinsi* is currently known only from Panama.

Calicosama robbinsi Hall and Harvey, new species
Figs. 2a, b, 5a–c

Description. *Male*: Forewing length HT 18 mm; average 16.5 mm (N = 5). Forewing elongate, costal margin straight, distal margin slightly convex; hindwing some-

what elongate, apex and tornus rounded. *Dorsal surface.* Forewing ground color russet brown; costa black, black mark with blue scaling distally at base, middle and end of discal cell, two black marks at base of cell Cu2 surrounded by a few blue scales, white postdiscal triangle tapers from costa to vein M2 then abruptly narrows distally in cell M2, jagged black line extends from tip of triangle into cell Cu1; white rectangle at tornus extends two-thirds distance towards wing base below vein 2A, contains two faint black marks at submargin of cell Cu2 with russet brown intruding into middle of white in cell Cu2; submargin black lined proximally with blue triangles, blue scaling at margin of cell M3; fringe black except below vein Cu2 and as small patches of scales in cells M3, and M1 and R4+5. Hindwing ground color white; black at very wing base, a small disjunct black fleck towards base of discal cell; fringe entirely white. *Ventral surface.* Forewing differs from dorsal surface in following ways: ground color black, gray-brown at wing base below discal cell; spots at base of cell Cu2 paler brown, those in discal cell encircled by pale blue scaling with further blue scaling in basal half of cell, blue scaling proximal to upper postdiscal markings; submarginal triangles blue-white and formed into circles, additional blue-white scaling at margin of cells M1 and R4+5. Hindwing differs from dorsal surface in following ways: mottled pale brown scaling along basal two-thirds of costa, three black spots towards base, at middle and towards distal end of cell Sc+R1, a few black marginal scales in cells M2 and M1. *Head.* Labial palpi a mixture of brown and white scales; second and third segments elongate. Eyes bare and black, marginal scaling white. Frons brown with faint white medial band and white lateral scaling. Antennal segments brown with white lateral scaling, narrow nudum along ventral inner margin; clubs brown, tips orange brown. *Body.* Dorsal surface of thorax dark brown with dark brown tegula, ventral surface white; dorsal and ventral surface of abdomen white; all legs white. *Genitalia* (Fig. 5a, b). Distal margin of uncus produced into two small points ventrally, slightly concave dorsally; falces of average size and width; vinculum incomplete dorsally at anterior margin of tegumen, thickened in upper portion, very small saccus ventrally; valvae vertically elongate with a small upper basal bulge, a broad triangular projection that curves slightly inwards at middle of distal margin, and a large ''bird's head''-shaped upper distal projection; aedeagus of approximately even width, tapers gradually at tip which opens broadly to right, soft anterior tissue directed ventrally; everted vesica an elongate tube of approximately even width, basal half contains a slightly curved band of densely packed spines (smallest spines medially and laterally), oval-shaped raised area beside posterior half of cornutal band consists of numerous rows of sparsely spaced, tiny spines; pedicel heavily sclerotized and broad. Distal and ventral margin of eighth tergite concave, producing triangle at lower posterior corner. Eighth sternite heavily sclerotized at distal tip, and produced into two long, slightly inwardly curving, asymmetrical posterior projections, the right-hand one being somewhat longer (Fig. 5c).

Female: Unknown.

Types. Holotype, ♂, PANAMA: **Canal Zone,** Gamboa, Cerro Pelado, 17 Nov 1978 (R. K. Robbins); in the National Museum of Natural History, Smithsonian Institution, Washington DC (USNM). Paratypes. PANAMA, **Canal Zone**: 3♂, same locality data as HT: 2♂, 16 Nov 1978; 1♂, 17 May 1979 (all R. K. Robbins). 1♂, No locality data (Acc. no. 11110); all in the (USNM).

Etymology. We name this species for Robert K. Robbins in recognition of his significant contributions to the systematics of lycaenoid butterflies, and the fact that he collected the majority of the type series.

Diagnosis. *Calicosama robbinsi* n. sp. closely resembles its congener *C. lilina,* but has a smaller wingspan (an average forewing length of 16.5 mm instead of the 20–22 mm typical of *C. lilina*), a slightly darker russet brown forewing ground color, heavy black scaling at the submargin and along the costa of the dorsal forewing, reduced blue scaling over the entire dorsal forewing, with none proximal to the jagged postdiscal black line and only half circles of blue scaling submarginally, a slightly smaller postdiscal white forewing costal triangle that has only a small triangle of white scales in cell M2 instead of a broad white bar that is nearly as broad as that in the cell above, and a black instead of brown ventral forewing ground color. The male genitalia of the two species differ significantly only in the exact arrangement of the aedeagal cornuti. In *C. robbinsi* the main cornutal band is slightly shorter, straighter and contains more evenly sized spines, and the bulbous area beside it is contiguous and contains smaller, more sparsely positioned spines (see Figs. 4b, 5b).

Discussion. *Calicosama robbinsi* is clearly very rare and localized since it is not represented in any of the World's major collections (see Hall, 1999b, for a partial list of those examined) except the USNM. Males were encountered perching 2 to 4 meters above the ground out over the edge of a steep hilltop during the late afternoon, and were active even in slightly overcast weather; their flight was rather weak (R. Robbins, pers. comm.). Individuals have thus far been collected only during the months of May and November, which mark the beginning and end of the rainy season respectively in central Panama. *C. robbinsi* is currently only known from the canal zone of central Panama but will undoubtedly prove to have a broader range that includes the wet forest habitats of neighboring Costa Rica, and the Chocó region of west Colombia and possibly Ecuador.

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LITERATURE CITED

Bridges, C. A. 1988. Catalogue of Lycaenidae and Riodinidae (Lepidoptera: Rhopalocera). C. Bridges, Urbana. 798 pp.

Bridges, C. A. 1994. Catalogue of the Family-Group, Genus-Group and Species-Group Names of the Riodinidae and Lycaenidae (Lepidoptera) of the World. C. Bridges, Urbana. 1113 pp.

Butler, A. G. 1870. On new or recently described species of diurnal Lepidoptera. Ent. Mon. Mag. 6(71):250–252.

Comstock, J. H. and J. G. Needham. 1918. The wings of Insects. Amer. Nat. 32(376):231–257.

DeVries, P. J. 1997. The Butterflies of Costa Rica and their Natural History, Vol. II. Riodinidae. Princeton University Press, Princeton. xxv + 288 pp.

Eliot, J. N. 1973. The higher classification of the Lycaenidae (Lepidoptera): a tentative arrangement. Bull. Brit. Mus. Nat. Hist. (Ent.) 28(6):373–506.

Godman, F. D. and O. Salvin. 1886. Biologia Centrali-Americana. Insecta. Lepidoptera Rhopalocera, 1:441–487. Dulau & Co., B. Quaritch, London.

Hall, J. P. W. 1999a. The Genus *Theope* and Relatives: their Systematics and Biology (Lepidoptera: Riodinidae: Nymphidiini). Ph.D. dissertation, University of Florida, Gainesville. viii + 381 pp.

Hall, J. P. W. 1999b. A Revision of the Genus *Theope*: its Systematics and Biology (Lepidoptera: Riodinidae: Nymphidiini). Scientific Publishers, Gainesville. viii + 127 pp.

Hall, J. P. W. In press. Phylogeny of the riodinid butterfly subtribe Theopeina (Lepidoptera: Riodinidae: Nymphidiini). Syst. Ent. 26.

Hall, J. P. W., and D. J. Harvey. In press. A phylogenetic reassessment of the Neotropical riodinid genera *Juditha, Lemonias, Thisbe,* and *Uraneis,* with a revision of *Juditha* (Lepidoptera: Riodinidae: Nymphidiini). Syst. Ent. 26.

Hall, J. P. W., and J. B. Heppner. 1999. Lemoniadini, a corrected tribal name in the Riodininae (Lepidoptera: Riodinidae). Trop. Lepid. 10(1):30.

Harvey, D. J. 1987. The Higher Classification of the Riodinidae (Lepidoptera). Ph.D. dissertation, University of Texas, Austin. vii + 216 pp.

Klots, A. B. 1956. Lepidoptera, pp. 97–110 *in* S. L. Tuxen (ed.), Taxonomists' Glossary of Genitalia in Insects. Munksgaard, Copenhagen.

Lamas, G. 1976. Notas sobre mariposas peruanas (Lepidoptera). III. Sobre una colección efectuada en el Departamento de Tumbes. Rev. Per. Ent. 19(1):8–12.

Penz, C. M. and P. J. DeVries. 1999. Preliminary assessment of the tribe Lemoniini (Lepidoptera: Riodinidae) based on adult morphology. Amer. Mus. Novit. 3284:32 pp.

Stichel, H. F. E. J. 1910. Vorarbeiten zu einer revision der Riodinidae Grote (Erycinidae Swains.) (Lep. Rhop.). Berl. Ent. Zeit. 55(1/2):9–103.

Stichel, H. F. E. J. 1911. Lepidoptera Rhopalocera. Fam. Riodinidae. *In:* J. Wytsman (ed.), Genera Insectorum, 112(B):239–452. J. Wytsman, Brussels.

Stichel, H. F. E. J. 1930–31. Riodinidae, pp. 1–795 *in* E. Strand, (ed.), Lepidopterorum Catalogus, 38–41. W. Junk, Berlin.

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